# Variable Fidelity AeroPropulsoServoElasticity Analysis Tool, Phase I

Completed Technology Project (2015 - 2015)

## Project Introduction

CFDRC proposes to develop, validate, and demonstrate a variable-fidelity multi-physics framework for AeroPropulsoServoElastic (APSE) simulations of supersonic vehicles. The proposed effort will leverage previously developed AeroServoThermoElastic (ASTE) framework that will be advanced with newly developed non-intrusive efficient software integration methodology, and extended with the addition of an aircraft engine propulsion module to create an APSE analysis tool for next generation supersonic vehicles simulations. The developed framework will be verified against benchmark cases for accuracy and efficiency. Demonstration of the full capabilities of the technology will be conducted for a representative supersonic transport configuration in a supersonic flow environment. In Phase II, the capability of the framework will be extended by integrating additional NASA and industry preferred computational tools (both high fidelity and reduced order) to the framework. The usability of the framework will be improved by supporting NASA preferred input/output data formats, adding non-linear material models, support for NASA's open Multidisciplinary Design Analysis and Optimization (openMDAO) scripts and further improving the accuracy of the fluid and structure coupling. Validation and demonstration of the framework will be conducted on selected APSE problems.

## Primary U.S. Work Locations and Key Partners





Variable Fidelity AeroPropulsoServoElasticity Analysis Tool, Phase I

## Table of Contents

| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| CFD Research Corporation | Lead Organization | Industry | Huntsville, Alabama |
| 🟢 Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

| Primary U.S. Work Locations | |
|---|---|
| Alabama | Ohio |

## Project Transitions

▶ **June 2015:** Project Start

✔ **December 2015:** Closed out

　　**Closeout Summary:** Variable Fidelity AeroPropulsoServoElasticity Analysis Tool, Phase I Project Image

　　**Closeout Documentation:**
- Final Summary Chart Image*(https://techport.nasa.gov/file/139520)*
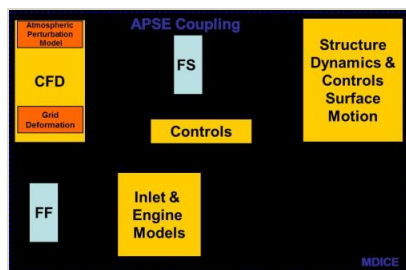
## Images



**Briefing Chart Image**
Variable Fidelity AeroPropulsoServoElasticity Analysis Tool, Phase I
*(https://techport.nasa.gov/image/130922)*

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

CFD Research Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management
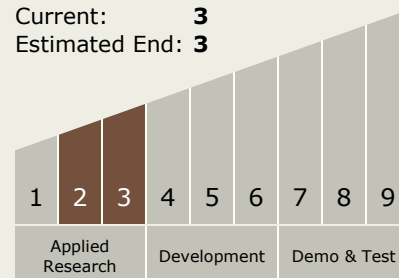
**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Chris Talley

## Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| | Applied Research | | Development | | | Demo & Test | | |

## Technology Areas

**Primary:**

- TX11 Software, Modeling, Simulation, and Information Processing
  └ TX11.3 Simulation
    └ TX11.3.7 Multiscale, Multiphysics, and Multifidelity Simulation

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System